Sustainable Development and the Assessment of Transport Infrastructure

Gudmundsson, Henrik

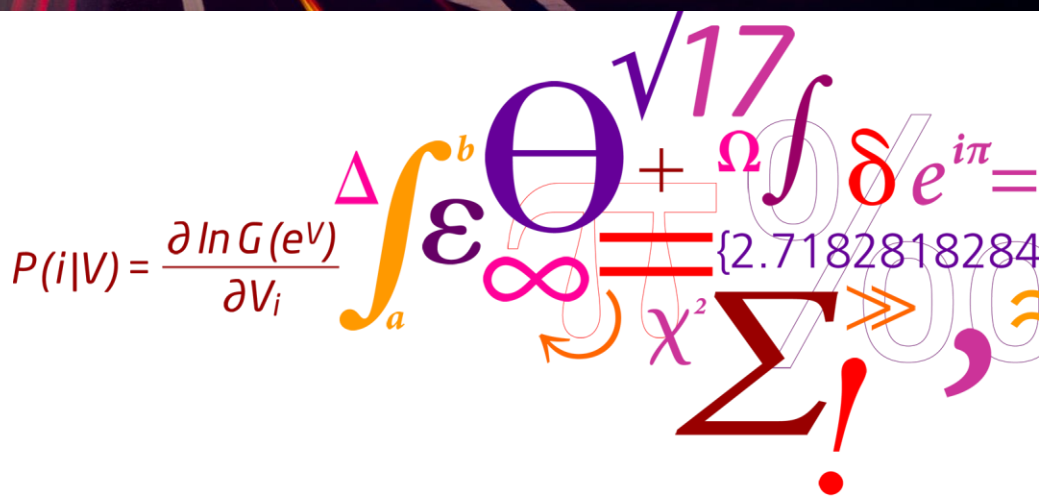
Publication date:
2014

Document Version
Peer reviewed version

Sustainable Development and the Assessment of Transport Infrastructure

Dr. Henrik Gudmundsson, Technical University of Denmark
hgu@transport.dtu.dk

International Conference on the Role of Transport and Transit Corridors in Ensuring International Cooperation, Stability and Sustainable Development'
Ashgabat, Turkmenistan, 3-4 September 2014



DTU Transport
Department of Transport

Increasing attention to sustainable transport

The Future we want" (Rio +20) 2012

"132 We note that transportation and mobility are central to sustainable development….'

" 133 We support the development of sustainable transport systems'

MDBs commitment to sustainable transport

"to provide more than $175 billion of loans and grants for transport in developing countries over the coming decade, that will be increasingly oriented towards sustainable transport"

European Unions Transport policy White Paper

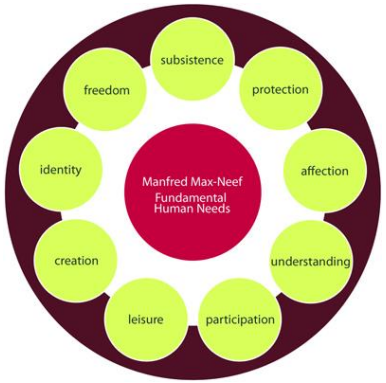
- Reduce CO_2 emissions by 60% in 2050
- Break dependence on oil, Promote clean fuels

*"**Sustainable Development** is development that meets the needs of the present without compromising the ability of future generations to meet their own needs"*

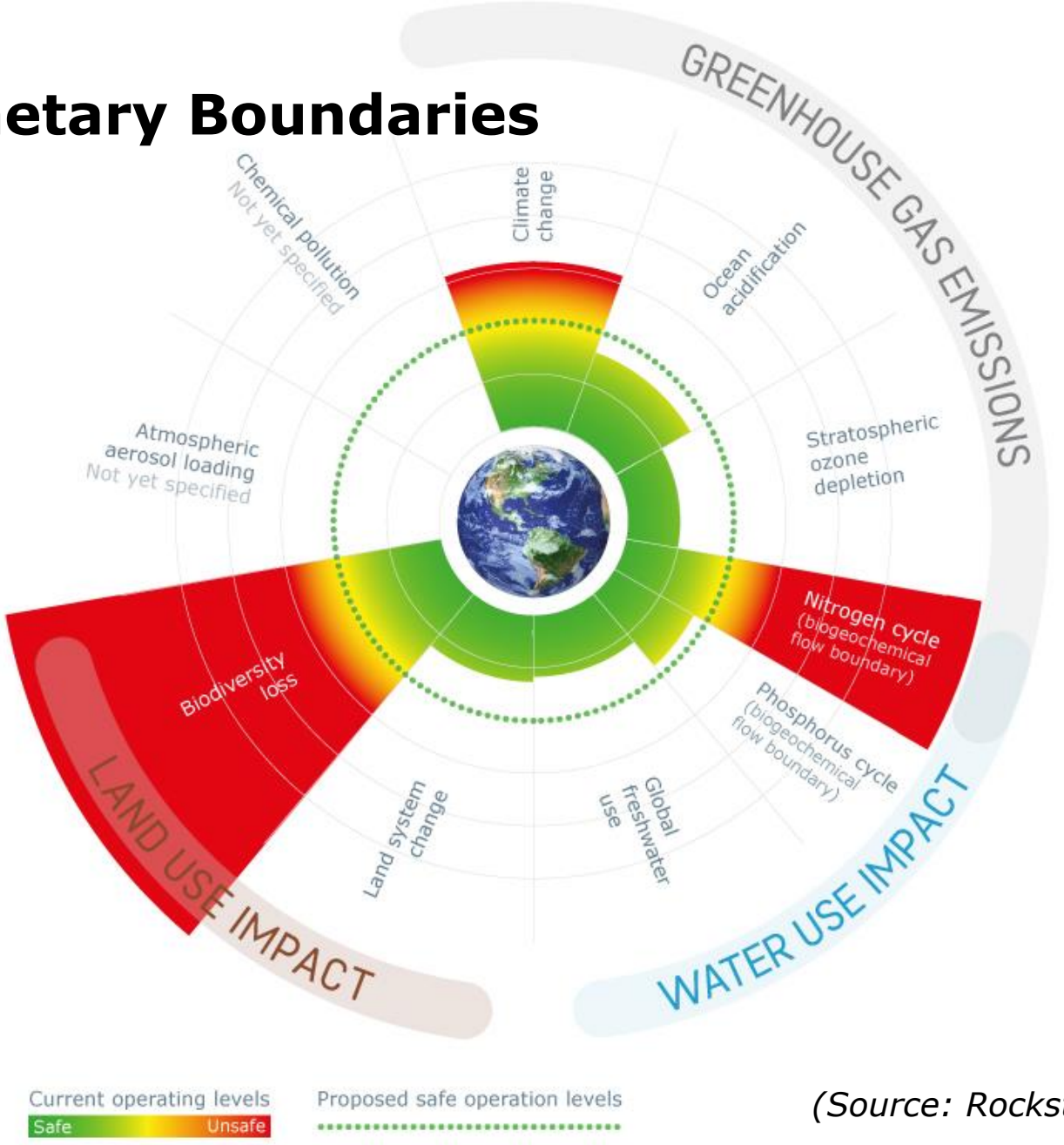
It contains within it **two key concepts**:

· the concept of '**needs**', in particular the essential needs of the world's poor to which overriding priority should be given;

· the idea of **limitations** imposed by the state of technology and social organization on the environment's ability to meet present and future needs.



Planetary Boundaries



(Source: Rockström et al 2009)

Transport and climate change (IPCC 2014)

1) **Transport accounts for about a quarter of global energy-related carbon emissions.** This contribution is rising faster than for any other energy end-use sector; direct transport carbon emissions could double by 2050.

2) **Impacts of climate change** could damage transport infrastructure such as roads, railways and ports, requiring extensive adaptation and changes to route planning in some regions.

3) **Cutting carbon emissions from transport is challenging,** given the continuing growth in demand and the slow turnover of stock and infrastructure

4) **Many energy efficiency measures have a positive return on investment,** and could cut energy consumption by 30–50% by 2030. Some of these measures have a negative lifetime cost.

5) **Efficient, low-carbon transport systems have significant co-benefits** such as better access to mobility services for the poor, time saving, energy security, and reduced urban pollution

Source: BSR/Cambridge summary of IPCC AR5 (2014)

Climate impacts of trade: Transport is a large part

- International transport is responsible for **33 %** of world-wide trade-related CO_2 emissions

- For some product groups like transport equipment, electronic equipment and machinery, the transport is responsible for over **75%** of emissions

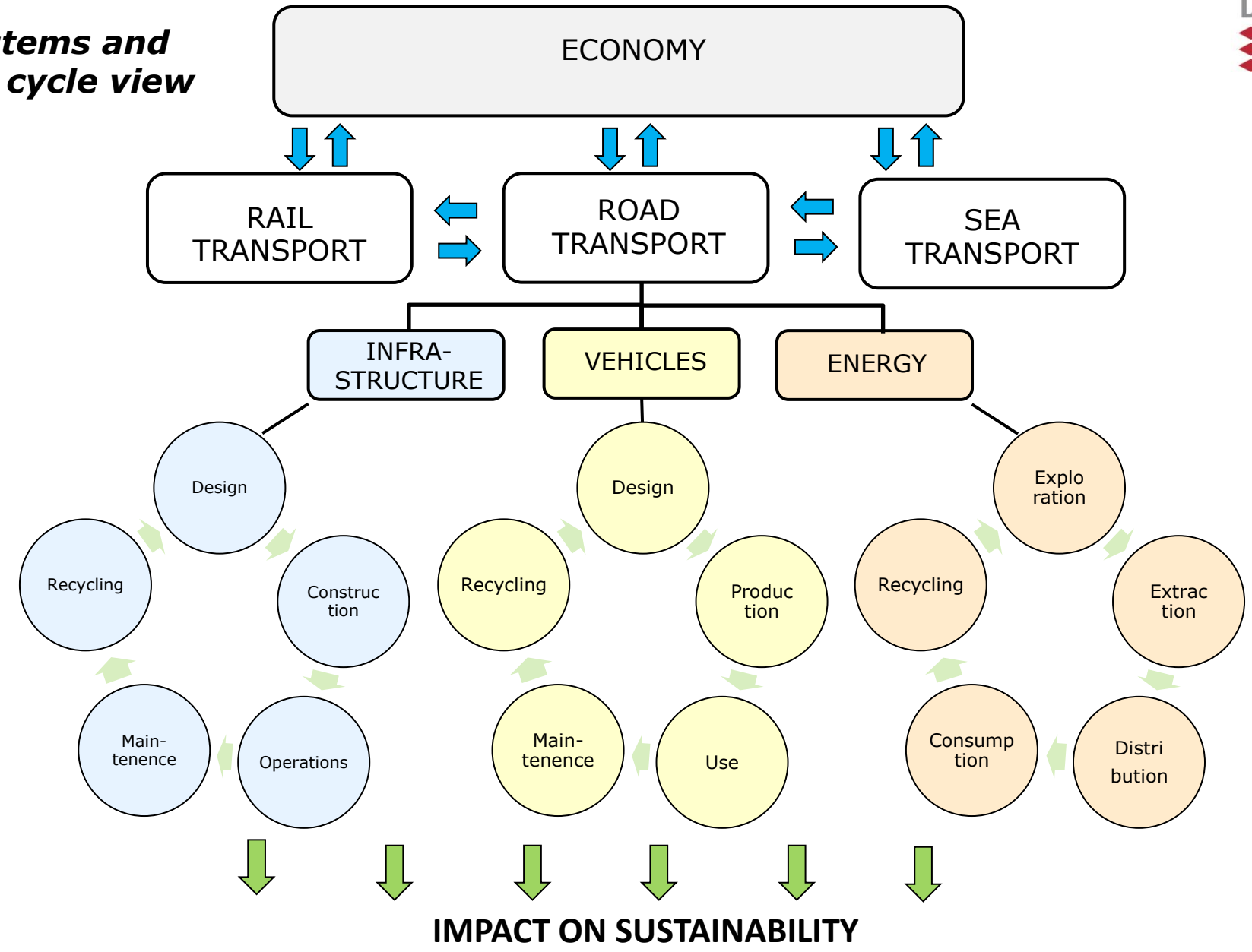
- Trade patterns are shifting, so transport will likely gain even **larger shares** for some product groups in the future.

(Cristea et al 2013)

Impacts of transport – positive/negative

Environmental	Social	Economic
• Air pollution • Noise pollution • Vibrations • Light pollution • Visual intrusion • Water pollution • Consumption of land/urban sprawl • Release of toxic/hazardous substances • Solid waste • Disruption of ecosystems and habitats • Hydrologic impacts • Introduction of exotic species • Depletion of the ozone layer • Global climate change	• Mobility • Accessibility • Accidents • Obesity • Barriers for the disadvantaged • Community livability • Gender imbalances • Cohesion/integration • Opportunity • Migration • Anxiety/'Rootlessness'	• Travel time • Costs of transport to customers/consumers •Transportation facility construction costs • Maintenance and disposal costs • Costs relating to accidents •Transportation-related health costs •Stimulation of economic growth • Agglomeration and labour market effects • Opportunity costs

Systems and life cycle view

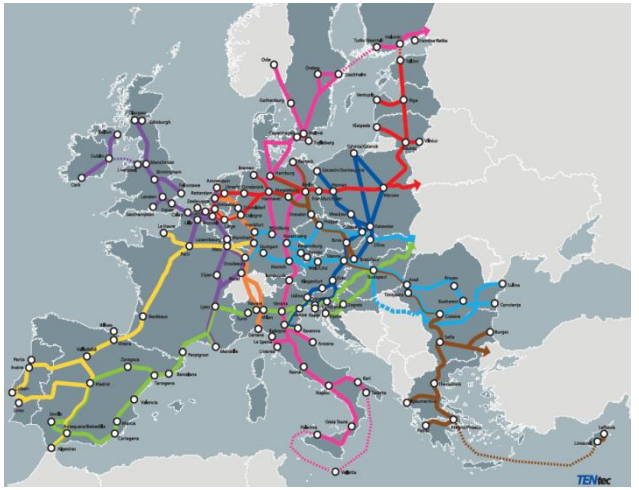


Sustainability aspects for Transport corridors

'Corridor' concept

Not just basic infrastructure facilities, also:

- transport technologies (including ICT applications, energy systems etc.);
- logistics solutions (including business models); and
- transport policies and regulatory procedures



SuperGreen research project

- to support the development of sustainable transport networks by fulfilling requirements covering environmental, technical, economical, social and spatial planning aspects

SuperGreen: KPIs for corridors

Table 4. Benchmarking results (all corridors)

Corridor	Mode	Cost (€/tkm)	Av. speed (km/h)	Reliability (%)	Frequency (no/year)	CO_2 (g/tkm)	SOx (g/tkm)
Brenner	Intermodal	0.03-0.09	9-41	95-99	26-624	10.62-42.11	0.02-0.14
	Road	0.05-0.07	19-40	50-99	104-2.600	46.51-71.86	0.05-0.08
	Rail	0.05-0.80	44-98	50-100	208-572	9.49-17.61	0.04-0.09
	SSS	0.04	23	100	52	16.99	0.12
Cloverleaf	Road	0.06	40-60	80-90	4.680	68.81	0.09
	Rail	0.05-0.09	45-65	90-98	156-364	13.14-18.46	0.01-0.02
Nureyev	Intermodal	0.10-0.18	13-42	80-90	156-360	13.43-33.36	0.03-0.15
	SSS	0.05-0.06	15-28	90-99	52-360	5.65-15.60	0.07-0.14
Strauss	IWT	0.02-0.44	-	-	-	9.86-22.80	0.01-0.03
Mare Nostrum	SSS	0.003-0.20	17	90-95	52-416	6.44-27.26	0.09-0.40
	DSS	-	-	-	-	15.22	0.22
Silk Way	Rail	0.05	26	-	-	41.00	-
	DSS	0.004	20-23	-	-	12.50	-

SuperGreen:
Sustainable measures for European corridors

- Improvement of green supply chain design and management;
- Harmonisation of policies and regulations;
- Development and harmonisation of transport infrastructure and technology;
- Harmonisation and development of ICT solutions and transport documents;
- Ensuring supply of good quality labour

Necessary **technologies** of greening freight corridors:

- alternative clean fuels,
- energy efficiency improvements,
- smart telematic applications

Conclusion: Some options to promote Sustainable Transport Systems (1)

1) General policy level

- Consider planetary boundaries and sustainable development goals
- Integrated transport policy across modes
- Internalization of external costs (and reducing subsidies)
- International fuel consumption standards for trucks
- Providing education in sustainable transport solutions
- Including sustainability impacts in monitoring and benchmarking systems

Conclusion: Some options to promote Sustainable Transport Systems (2)

2) Design and construction of infrastructure corridors

- Ensure effective and inclusive environmental assessment procedures
- Adopt a life cycle perspective (life cycle cost and impacts)
- Build in climate resilience
- Prepare for alternatives to diesel and petrol for road transport

Conclusion: Some options to promote Sustainable Transport Systems (3)

3) Management and operation of mobility

- **Avoid** unnecessary transport, by using planning and ICT
- **Shift** transport to least polluting modes via pricing and investment
- **Improve** the energy and environmental performance of mobility technology through regulations, incentives and logistics

Final remarks

- ”What you do in life echoes in eternity”

- A Sustainable Silk Road?